

# LIVERMORE LAB REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, Feb. 25-March 1, 2013.



## TURNING UP THE HEAT ON COLD CASES



**Bruce Buchholz loads a sample in the accelerator.**

Lawrence Livermore is applying its know-how to help solve police cold cases.

The Lab was established in the Cold War to advance American nuclear weapons. Now the national lab is applying its expertise in nuclear "bomb pulse" radiocarbon analysis to help solve cold cases.

There are more than 40,000 cold cases in the United States where traditional approaches have failed to identify the victim through their remains. The Lab's Bruce Buchholz -- working with international collaborators Swedish Karolinska Institute in Sweden and the British Columbia Institute of Technology -- have created a new way to figure out ages and birth dates on those cases.

The new approach, combining Livermore's expertise with new anthropological analysis and forensic DNA techniques, has already yielded results.

To read more, go to [Fox News](#).

## WIRED I SPY A DISTANT PLANET



**The Gemini telescope in Chile will soon house the Gemini Planet Imager.**

The hunt for planets out of this world will soon benefit from a telescope that Lawrence Livermore helped develop.

The Gemini Planet Imager (GPI), a new smart-car-sized telescope instrument, will use "extreme" adaptive optics to directly see distant planets around other stars. The Laboratory has been instrumental in the creation of adaptive optics.

Most large telescopes on Earth use adaptive optics -- mirrors that wiggle a thousand times a second -- to compensate for distortion from the atmosphere that causes the familiar "twinkling" effect of stars.

GPI will actually take direct images of distant exoplanets. A component of the instrument blocks light from the extremely bright star, but lets light coming from the hot, young planets circling the star to pass through, enabling astronomers to see those planets, which appear as a clear dot on the image.

To read more, go to [Wired Magazine](#).



## A NEW SPIN ON BLACK HOLES



**This artist's concept illustrates a supermassive black hole with millions to billions times the mass of our sun. Credit: NASA/JPL-Caltech.**

The spin rate of a supermassive black hole located at the center of spiral galaxy NGC 1365 is about to teach us a whole lot more about how black holes and galaxies mature.

Lawrence Livermore researchers and collaborators have finally taken definitive calculations of such an incredible spin rate in a distant galaxy thanks to data taken by the Nuclear Spectroscopic Telescope Array, or NuSTAR, and the European Space Agency's XMM-Newton X-ray satellites.

The team of scientists has peered into the heart of NGC 1365 with X-ray eyes, taking note of the location of the event horizon – the edge of the spinning hole where surrounding space begins to be dragged into the mouth of the beast.

"We know that black holes have a strong link to their host galaxy," said astrophysicist Bill Craig, a member of the LLNL team. "Measuring the spin, one of the few things we can directly measure from a black hole, will give us clues to understanding this fundamental relationship."

To read more, go to [Universe Today](#).

## **nature** A BONANZA OF GAS



**A natural gas plant.**

Though the amount of shale gas in China is plentiful, tapping that huge reserve is not easy.

To offset some of the coal use that contributes to its status as the world's largest greenhouse-gas emitter, China wants to boost natural gas from around 4 percent of the country's energy

mix to 10 percent by 2020. China's leaders resolved to boost annual shale-gas production from near zero to at least 60 billion cubic meters by 2020.

That is unlikely to happen quickly, however, according to Julio Friedmann, chief energy technologist at Lawrence Livermore. "In the United States, it took 60 years and 200,000 wells" to lay the groundwork for the shale-gas revolution. China has drilled fewer than 100 wells, and its geology is different. Many of the Chinese shale formations have a high clay content, for instance, which makes them more pliable and less apt to fracture. Many also are deeper. "We simply have no idea about whether the geology is going to produce," Friedmann said.

By comparison, the United States produced more than 150 billion cubic meters of natural gas in 2010.

To read more, go to [Nature](#).

## **Innovation** SPEEDING UP DRUG DELIVERY

AMERICA'S JOURNAL OF TECHNOLOGY COMMERCIALIZATION



**Avi Thomas works with a biological accelerator mass spectrometry (bioAMS) instrument at Lawrence Livermore National Laboratory.**

The search for a new drug -- whether to treat cancer or a flu pandemic -- is time consuming and costly, requiring up to 15 years and hundreds of millions of dollars to turn an idea into an effective product.

An approach that holds great promise for drug discovery is accelerator mass spectrometry (AMS), an extremely accurate method for dating bones, tree rings, ice cores and other carbon-bearing materials.

In the late 1980s, Lawrence Livermore scientists were the first to apply the sensitivity of AMS to biological testing. Over the last 25 years, bioAMS research has revealed how animals and humans metabolize carcinogens, vitamins and toxins.

AMS is unique in that it can measure extremely low concentrations of substances with a high level of accuracy. To study how humans respond to an existing or candidate medication, Lawrence Livermore

researchers and medical collaborators developed a technique called microdosing, in which a patient takes just 1/100 of a normal therapeutic dose. The drug's "fate" in the patient's body can easily be measured and studied.

To read more, go to [Innovation](#).

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LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance. To send input to the *Livermore Lab Report*, send [e-mail](#).